

National Aeronautics and Space Administration



Enterprise Managed Cloud Computing at NASA

Office of the Chief Information Officer

NASA IT Vision: *The NASA IT Organization is the **very best** in government*



Karen Petraska
NASA Office of the CIO
Computing Services Service Office (CSSO)
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What is Cloud Computing?

Cloud Computing in a Nutshell



Cloud computing is already a pervasive part of our personal lives – Dropbox, Google Docs, iCloud

- A new method of providing access to computing resources
 - Applications
 - Platforms (e.g., development, run-time, operations)
 - Servers, Networks, Storage
- A shift in policies, and business and technical models to enable:
 - Computing assets that are rented rather than owned
 - Computing resources that are shared among projects and users
 - “Pay as you go”
 - Self-service, on-demand



Drivers for an Agency Approach to Management of Cloud



Federal Guidance/Mandates

- Federal Data Center Consolidation Initiative (FDCCI)
- Cloud First Initiative
- The Federal CIO's 25 Point Plan for increasing IT efficiency
- Strategic sustainability performance plans
- Budget sequestration/ administrative savings, including reduction in real estate footprint
- NASA Inspector General findings calling for Agency enterprise management of cloud usage

Tenets of an Agency Approach to Cloud

- Simplify using the cloud for managed cloud providers and end users
- Reduce complexity of IT security and implementation
- Increase control of data and minimize data sprawl
- Leverage volume pricing and economies of scale
- Achieve uniformity in procurement and governance approaches
- Provide a uniform "pay as you go" approach
- Assure that expenditures do not exceed budgetary thresholds
- Implement and share best practices
- Improve customer service

Agency Needs and Expectations

- Workforce interest in cloud services is increasing very rapidly
- No longer a question of if adoption will occur; "how" is the new concern
- Ability to do more mission faster and at a lower cost
- Scalability to get to the next magnitude of discovery
- Easy access to NASA public data for non-NASA individuals
- Better ways to address big data sets
- Reduction of capital investments
- No more waiting to access hardware and software innovations
- Eliminate under-utilized assets

A Materials Engineering Case Study

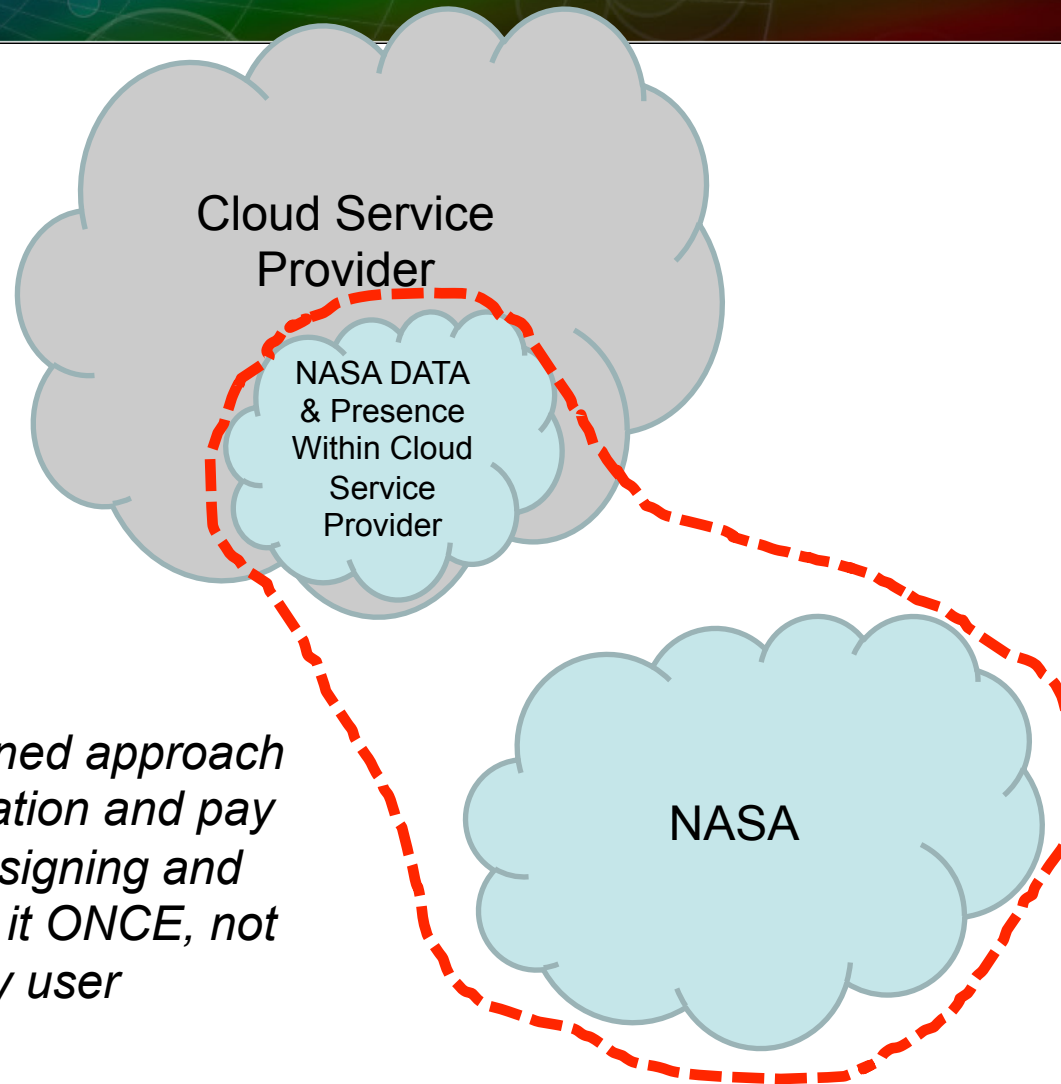


Cloud computing enables more mission to be accomplished per dollar and per hour.

- Needed to determine all materials that could potentially replace silicon in chips
- Application was professionally optimized to run on AWS
- Calculation required massive computing resources
 - Used AWS resources in all 8 regions
 - 156,000 cores
 - 2.3 Million wall clock hours
- Results were obtained in less than one day for \$33K



Enterprise Approach: New Boundary



Define a planned approach for this integration and pay the cost of designing and implementing it ONCE, not once for every user



An Enterprise Approach



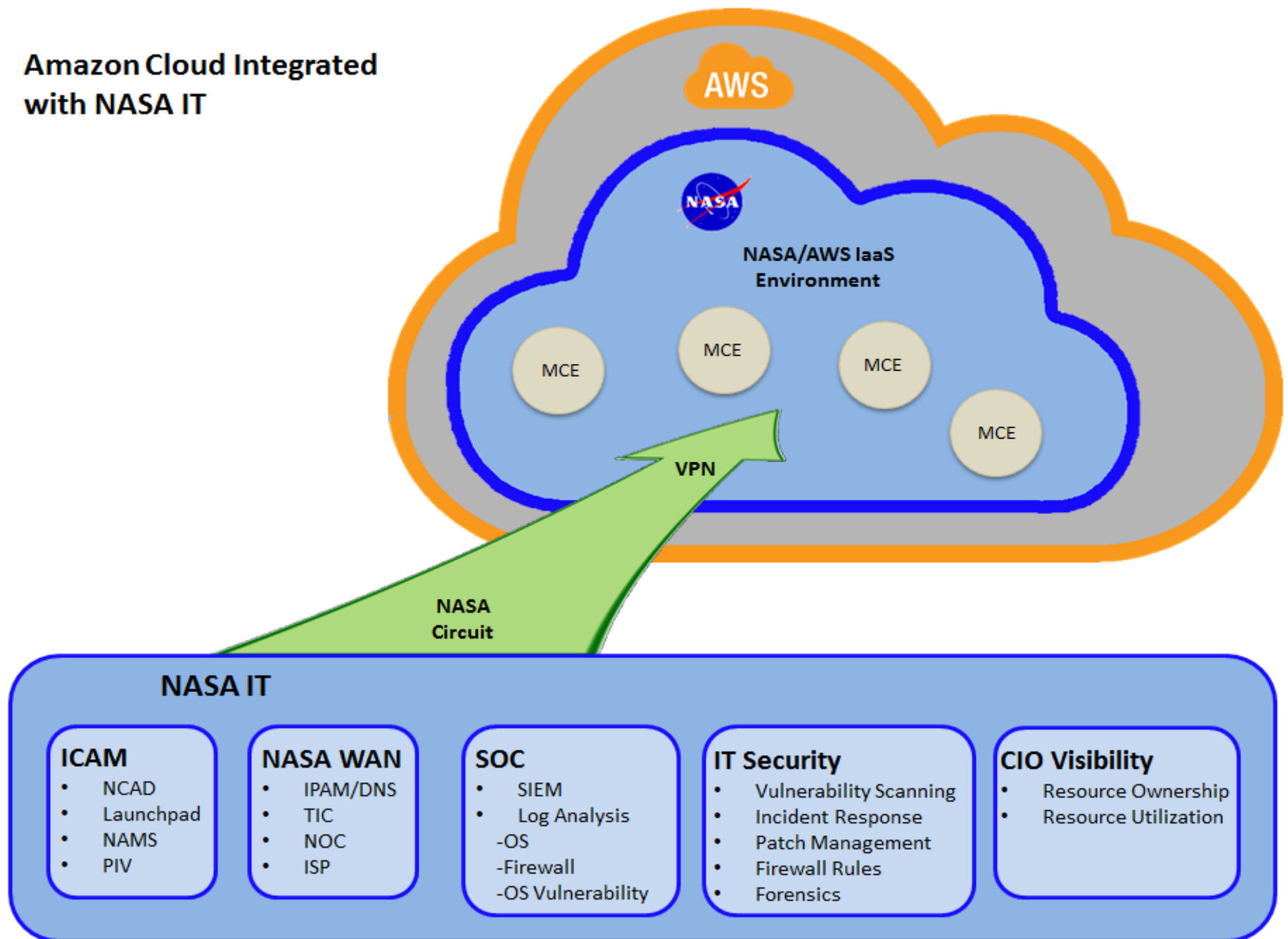
Key Elements of an Enterprise Approach



An enterprise approach results in faster adoption, greater consistency, managed risks, and lower Agency costs

- Standardized Agency governance
- Standards and guidance for technical integration with Agency infrastructure, processes, and services
 - Networking
 - Security operations
 - Authentication services
- Integrated hierarchical approach to FedRAMP compliance
- Common procurement vehicles with proper terms, conditions, best practices
- Payment system to facilitate “pay as you go” within Agency constraints
- Integration with Agency IT service catalog and help desk

Amazon Cloud Integrated with NASA IT





Tiered Services Architecture

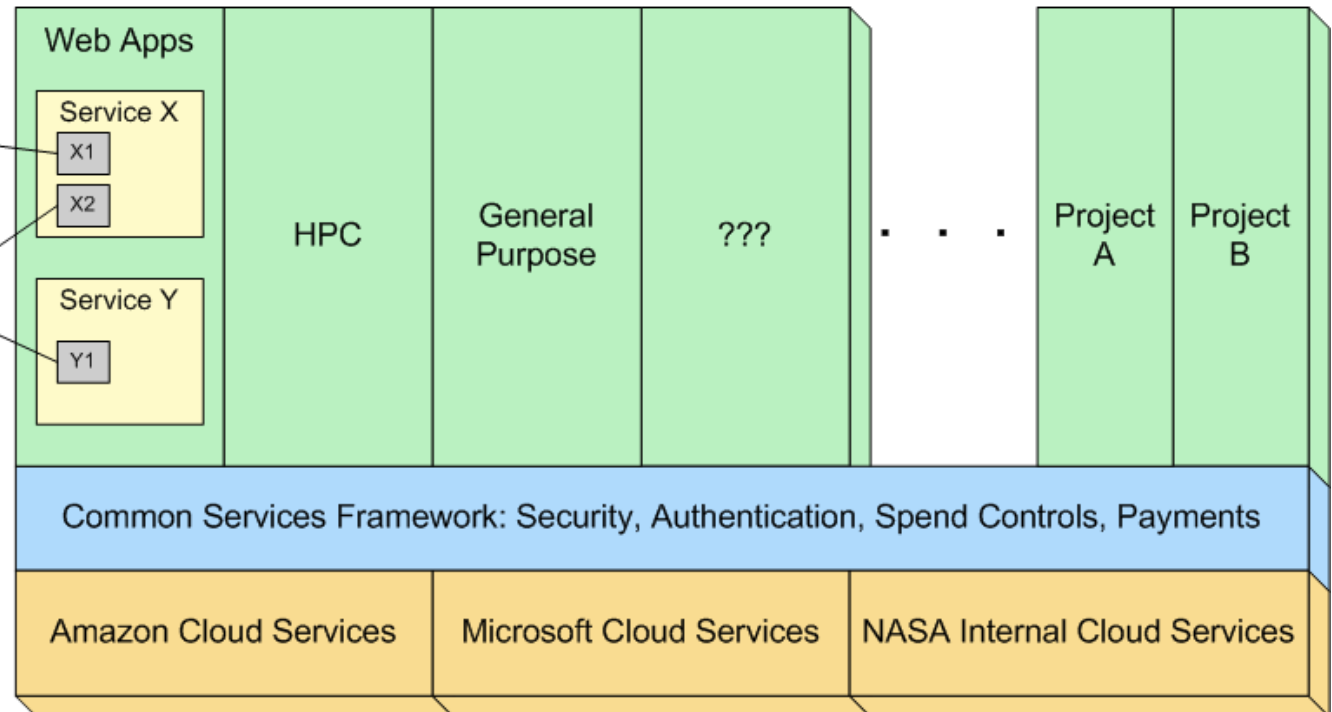


Functional, community, or project oriented workspaces. Focus is common tools, processes and topics, not geography. MCE's require ownership and resource commitments for creation and on-going operation. Not Adhoc



Community Managed Cloud Environments (MCEs)

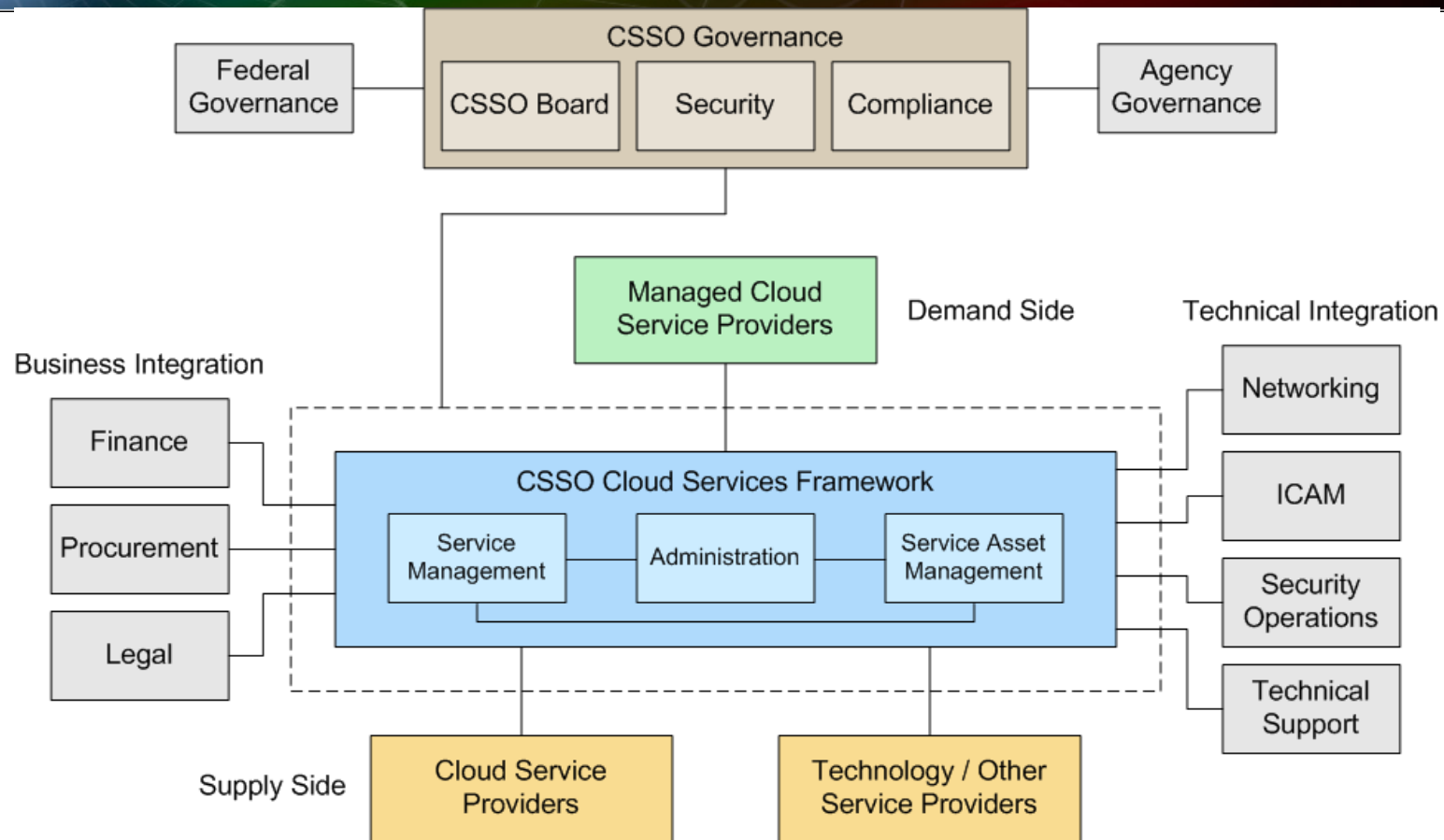
Project MCEs



OCIO provided common integration guidance and services

Cloud service providers (CSPs) both commercial and internal

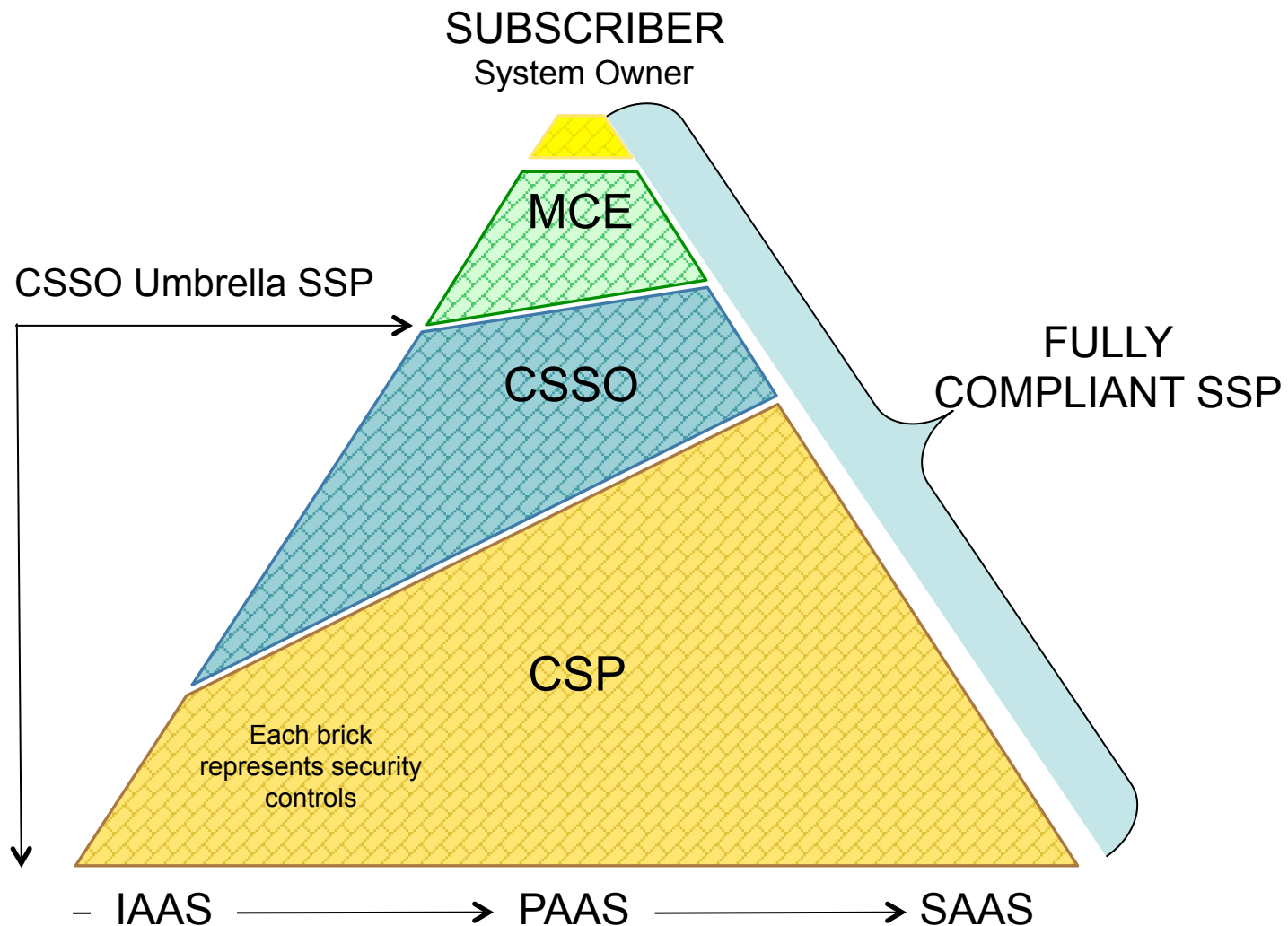
OCIO/CSSO is a Services Integrator that enables Managed Cloud Service Providers to provide Cloud Computing Services to Consumers by leveraging our Common Services Framework.



The Cloud Services Framework consists of capabilities and resources (e.g., people, processes, information, technology) that are integrated to provide Services to MC Service Providers.



FedRAMP and the Security Control Responsibility Hierarchy





Early Adopters



- NASA's enterprise cloud environment is operating as a working pilot
 - » Gaining operational experience with the environment
 - » Encouraging participation of computing savvy users
 - » No SLAs between the CSSO and NASA organizations for now
- There are two ways to participate in the NASA enterprise cloud environment at this time:
 1. Join the general purpose MCE as a user (95+ % of interested people want this option) and learn the ins and outs
 2. Become a service provider and stand up a new MCE in the enterprise environment with the guidance of the CSSO.
- Best way to engage at this time is to contact Karen Petraska or Ray O'Brien.



Status and the Road Ahead



Watch This Space!



The CSSO Common Services Framework enables the Agency to leverage the vast potential of Cloud Computing with minimal startup investment.

- NASA now has a Cloud “On Ramp”
 - Major challenges (business, technical, security) addressed for early adopters
 - Time-to-value window significantly shortened through investments
 - Groups, projects, teams with certain use case profiles can realize value today
 - Steady stream of interested customers
- But... we still have a lot of work to do
 - Cloud Computing continues to rapidly evolve
 - Need to support additional use cases, and integrate new services/capabilities as driven by demand and industry maturity
 - Need to bring core elements of enterprise approach to next level of maturity



NASA's Future in the Cloud



The current challenges of process and structure will soon be replaced by new challenges of scalability and variability.

Broad Adoption is Around the Corner

- General consensus of Cloud knowledgeable people is that within 5 years:
 - 75% of all new project starts will be born in the Cloud
 - 100% of NASA's public data will be served from the Cloud
 - Up to 40% of legacy systems will be migrated to the Cloud on lifecycle modernization
- Success criteria for Cloud adoption:
 - On-board 2 communities per year for 5 years
 - Demonstrates a rich representation of NASA's overall business being done in the Cloud



BACKUP CHARTS

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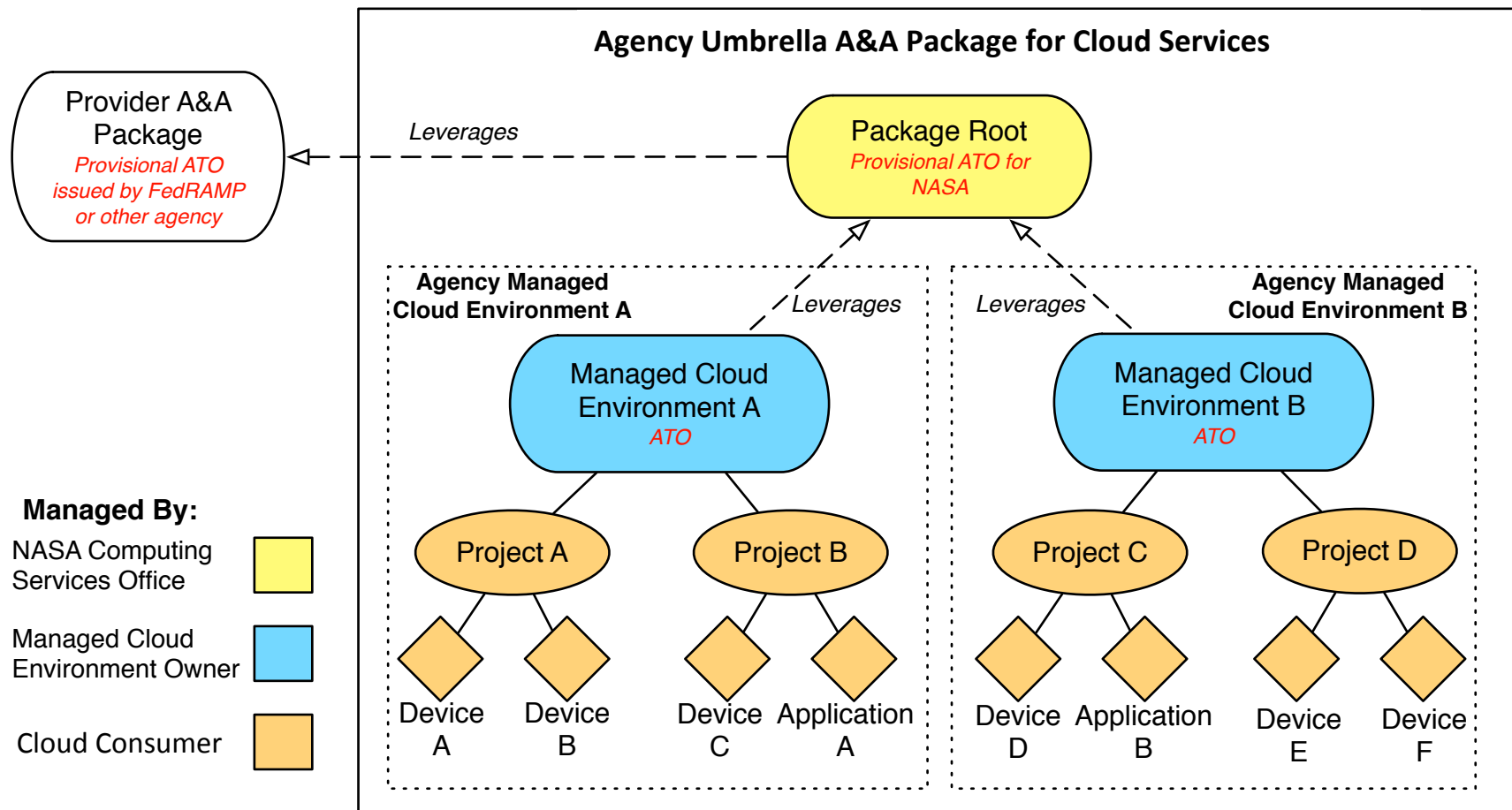
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10/17/14



Umbrella A&A Package (1)



Approach and Key Determinants



We used a customer-driven approach to assure the Use Cases represent real-world Agency needs.

- Performed “Top-Down Analysis” to identity key variables that drive variability among Use Cases
 - MC Deployment Model (private, public, community, hybrid)
 - MC Service Model (IaaS, PaaS, SaaS, DaaS)
 - MC Marketplace (open, closed)
 - MC Funding Model (retail, funding pool)
- Performed “Bottom-Up Analysis” of over 30 customer requests
- Rationalization of analyses distilled 6 primary Cloud Computing Use Cases



Primary Use Case Profiles

